

# Is it enough in ovarian cancer staging surgery to laparoscopic surgery? Comparison of surgical methods

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## Summary

**Objective:** This study was carried out to compare conventional laparotomy with laparoscopic surgery for ovarian cancer and identify no difference between conventional laparotomy and laparoscopic surgery for advanced ovarian cancer. **Materials and Methods:** Targeting 249 patients, who had been diagnosed with ovarian cancer and had undergone treatment in general university hospitals over ten years, this study was conducted with two gynecologic oncologists. The patients were placed in a laparotomy group (group 1) and a laparoscopic surgery group (including robotic surgery) (group 2). **Results:** One hundred ninety-two of a total of 249 patients belonged to the laparotomy group and 57 patients belonged to the laparoscopic surgery group. With regards to ovarian cancer staging, 80 of 249 (32.1%) patients were in Stage I-II and 129 of 249 patients were in Stage III-IV. Twenty of 249 (8%) patients (16 of 192 patients in group 1, 4 of 57 patients in group 2) suffered from operative complications and one great vessel injury was found in group 1. Sixty-nine of 249 patients (27.7%) [58 of 192 patients in group 1 (30.2%) and 11 of 57 patients in group 2 (19.2%)] had a relapse. In terms of the correlation between recurrence and operative methods, and risk, the hazard risk (HR) was measured at 0.552 (0.267–5.343), indicating that there was no close correlation. **Conclusion:** Laparoscopic surgery is not inferior to laparotomy for advanced ovarian cancer and it is therefore anticipated that laparoscopic surgery can be considered a treatment for early stage and unidentified stage ovarian cancer with low HE 4 and CA 125.

**Key words:** Ovarian cancer; Laparotomy; Laparoscopy; Cancer staging.

## Introduction

Conventionally, ovarian cancer surgery brings laparotomy to mind. Most of other gynecologic malignancies have already been treated with laparoscopic surgery or robotic surgery over the past 30 years [1], but due to the difficulty in completely removing a large intra-abdominal mass without spillage and the limited access to various organ transplant operations, which might accompany metastasis to other organs, laparoscopy has only been applied to early ovarian cancer. However, commencing with early ovarian cancer, it is progressively being shifted to laparoscopic surgery or robotic surgery [2]. The rapid advances in laparoscopic technology over the past years makes it possible to incise any intra-abdominal organs including the liver [3], and laparoscopic surgery can be even applied to advanced ovarian cancer. This study, therefore, aims to demonstrate the applicability of laparoscopic surgery to advanced ovarian cancer by comparing laparotomy to laparoscopic surgery in ovarian cancer staging.

## Materials and Methods

This study targeted 249 patients, who had been diagnosed with ovarian cancer and had undergone treatment in a general university hospitals over a decade from March 2008 to February 2017. Diagnosis and surgery were performed by two gynecologic on-cologists, and a laparotomy group and a laparoscopic surgery (including robotic

surgery) group were compared. The cases shifting from laparoscopy to laparotomy or those undergoing laparotomy after diagnostic laparoscopy were included in a final laparotomy group. Also, recurrent cases after early treatment were compared and evaluated. Using a retrospective method, basic information, operation information, and laboratory findings of patients were compared. For statistical analysis of data, Paired *t*-test, One Way ANOVA, and Pearson Chi-Square Statistics were conducted and SPSS 14.0K program was employed. When the *p*-value was below 0.05, it was considered statistically significant in this study.

## Results

The characteristics of patients depending on operation methods and comparison are shown in Table 1. The average age of total 249 patients was  $52.0 \pm 15.1$  years-old. One hundred ninety-two patients belonged to a laparotomy group (group 1) and 57 patients belonged to a laparoscopic surgery group (group 2). Eighty of 249 (32.1%) patients were in ovarian cancer stage I-II and 169 of them were in group 1 (Stage III-IV). Twenty of 249 (8%) patients (16 of 192 patients in group 1, 4 of 57 patients in group 2) suffered from operative complications. Seven of 249 patients (2.8%) suffered from wound complication, which occupied the largest proportion of operative complications found in the patients and six of 249 (2.4%) patients suffered from urological complication and gastrointestinal complication.

Table 1. — Comparison demographic and clinical characteristics of the patients according to operative method.

Variable (n = 249)	Laparotomy (n = 192)	Laparoscopy (n = 57)	p-value
Age at time of surgery mean years (SD)	53.5 (15.0)	47.0 (14.1)	0.512
CA125 at time of surgery (SD), U/mL	1022.9 (1935.9)	702.3 (1376.8)	0.127
HE4 (human epididymis protein 4) at time of surgery (SD), pmol/L	81.2 (234.7)	22.0 (49.8)	0.001
Complication (%)	16 (6.4)	4 (1.6)	0.434
Ovarian cancer stage (%)			
Stage I-II	49 (19.7)	31 (12.4)	< 0.001
Stage III-IV	143 (57.4)	26 (10.4)	
Recurrent state (%)			
No recur	134 (53.8)	46 (18.5)	0.071
Recur	58 (23.3)	11 (4.4)	
Cancer type (%)			
Epithelial ovarian cancer	177 (71.1)	43 (17.3)	0.001
Non-epithelial cancer	15 (6.0)	14 (5.6)	
Operation time (SD), minutes	239.3 (103)	196.1 (105)	0.833
Transfusion during operation (%)			
Non transfusion	154 (61.8)	54 (21.7)	0.005
Transfusion	38 (15.3)	3 (1.2)	

SD = mean standard deviation

One great vessel injury was found in Group 1. Sixty-nine of 249 (27.7%) patients relapsed and 47 of 249 patients (18.9%) died of diseases. Although there were no differences in age and CA 125 depending on operation methods, statistical significance was found in preoperative human epididymis protein 4 (HE4). There were statistically significant differences in ovarian cancer stages, ovarian cancer types, and blood transfusion during operation, but no differences were found in complications, the recurrence rate, and the operation time elapsed.

Comparison according to the recurrence is shown in Table 2. In comparison according to relapse, CA 125 ( $p$ -value < 0.001), complication ( $p$ -value = 0.023), and ovarian cancer type ( $p$ -value = 0.017) showed statistical significance. In relation to the correlation between recurrence and operation methods and risk, the hazard risk (HR) was measured at 0.552 (0.267–5.343), which means there was no close correlation.

## Conclusion

It has continuously been proven that laparoscopic surgery is more effective than conventional laparotomy in most gynecological conditions [4]. Moreover, with the advancement in technology for treatment of ovarian cancer, which is one of gynecologic cancers and scientific research, laparoscopic surgery is rapidly developing. In terms of early stage ovarian cancer, laparoscopic surgery causes less complication and requires shorter postoperative hospital stays than conventional laparotomy [5, 6]. It is also known that once laparoscopic surgery is applied, the blood loss during surgery is low, patients can resume eating soon, and the postoperative pain score is low [7]. In this study, laparotomy (49 patients of group 1, 19.7%) and laparoscopic surgery (31 patients of group 2, 12.4%) were applied to early stage ovarian cancer at a similar ratio. However,

laparotomy (143 patients of group 1, 57.4%) was much more applied to advanced stage ovarian cancer than laparoscopic surgery (26 patients of group 2, 10.4%). Since three years ago, laparoscopic surgery has been attempted for advanced ovarian cancer. Before that, it was only applied to early ovarian cancer and when there was a big risk of spillage to remove a hard or large mass, when an omental cake was removed or when cancer spread to organs, laparoscopic surgery was replaced with laparotomy. On the contrary, these were treated with laparoscopic surgery as a combined operation with surgery. Also, 20 of total 249 patients [8.0%] (16 of 249 patients in group 1 (6.4%), four of 249 patients in Group 2 (1.6%)) suffered from complications. Although the number of parameters was small, the lower proportion of complications in a laparoscopic surgery group indicates that complications decreased, as experience of patients in receiving laparoscopic surgery increased over time. Similar to the reports of other studies, the frequency of blood transfusion during operation was statistically low in a laparoscopic surgery group, but there were no statistical differences in intraoperative complications and the operation time.

Meta-analysis of many studies making a comparison between laparoscopic surgery and conventional laparotomy for early stage ovarian cancer reported that laparoscopic surgery brought better results, in relation to the postoperative complication rate and postoperative hospital stays and laparoscopic surgery had no significant difference from conventional laparotomy in the ovarian cancer recurrence rate [8, 9]. The largest concern when laparoscopic surgery is applied is recurrence caused by post-site metastasis and it is known that the incidence rate is 1% to 16% [10]. In this research, 69 of total 249 (27.7%) patients [58 of 249 patients in group 1 (23.3%), 11 of 249 patients in group 2 (4.4%)] suffered a relapse and a laparoscopic surgery group showed

Table 2. — Comparison of recurrences.

Variable (n = 249)	No recurrence (n = 180)	Recurrence (n = 69)	p-value
Age at time of surgery mean years (SD)	51.3 (15.8)	54.0 (12.8)	0.077
CA125 at time of surgery (SD), U/mL	683.3 (1485.9)	1643.9 (2380.0)	< 0.001
HE4 (human epididymis protein 4) at time of surgery (SD), pmol/L	70.2 (214.2)	60.9 (195.5)	0.91
Complication (%)	10 (0.1)	10 (0.2)	0.023
Cancer type (%)			
Epithelial ovarian cancer	154 (61.8)	66 (26.5)	0.017
Non-epithelial cancer	26 (10.4)	3 (1.2)	
Relation of surgical method according to recurrence	HR	95% CI	p-value
	0.552	0.267 – 5.343	0.13

SD = mean standard deviation; HR = hazard risk; CI = confidence interval.

a better result. However, there was no statistical significance ( $p$ -value = 0.071) and this result originated from the small number of N and the lower frequency of surgery for advanced ovarian cancer.

One post-site metastasis was found in a laparoscopic surgery group and one recurrence of the wound site was also found in a laparotomy group. A cancerous mass must be carefully incised in a bag or pouch without spillage and careful attention is needed during mass handling. The result of comparison among the patients that had a relapse showed statistically significant differences in CA 125, complications, and ovarian cancer types. In relation to the correlation between recurrence and operation methods, and risk, the hazard risk (HR) was measured at 0.552 (0.267– 5.343) and no statistical differences were revealed.

This study made a comparison between laparoscopic surgery and conventional laparotomy, which have been executed for all the stages of ovarian cancer over ten years. Although there were no statistical differences in age between the two groups and CA 125, statistical significance was found in a laparoscopic surgery group with a lower value of preoperative human epididymis protein 4 (HE4). This is because after the operation was conducted when ovarian cancer was not predicted, the patients were diagnosed with ovarian cancer. It was identified that for ovarian cancer, laparoscopic surgery was not inferior to conventional laparotomy. Given the statistical significance of HE 4, it was considered that laparoscopic surgery was chosen and applied when ovarian cancer was less advanced, since this attempt started recently for advanced ovarian cancer. Conventional laparotomy was applied when there was a need to remove larger and more masses and it is supposed that conventional laparotomy showed statistical differences in ovarian cancer stages, types, and blood transfusion during operation, compared to laparoscopic surgery, because combined operation with surgery and urology was conducted in many cases. Perhaps, the absence of statistical differences in the operation time and intraoperative complications is because in many cases, only open and close laparotomies were conducted or diagnostic laparoscope was followed by laparotomy.

Like the previous studies [11, 12], it seemed preopera-

tive CA 125 was associated with the recurrence rate in the patients with a relapse and some findings displayed association between the cancer types and the recurrence rate as well. As shown in these study results, laparoscopic surgery is not inferior to laparotomy for ovarian cancer and it is, therefore, anticipated that laparoscopic surgery can be considered as a treatment for early stage ovarian cancer and unidentified stage ovarian cancer with low HE 4 and CA 125.

#### Ethics approval and consent to participate

All subjects gave their informed consent for inclusion before they participated in the study.

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#### Conflict of interest

The authors declare no conflict of interest.

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